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V. I. LENIN AND NATURAL SCIENCE

[Following is the translation of an article by S. E. Sobolev entitled "V. I. Lenin i estestvoznaniye" (English version above) in "Voprosy filosofii" (Problems in Philosophy), No.7, 1960, Moscow, Pages 15-23.]

Lenin today is a majestic and symbolic figure. We link his name to that of a courageous scientist and innovator, as well as to a blazing, steadfast revolutionary, who not only succeeded in substantially advancing the science of human society, but who implanted his scientific conclusions into everyday life. The name of "leninist" has come to describe the characteristics of a steady contender for the cause of justice, for human happiness, of a man who is selfless, courages and devoted to principles. At the same time we see in Lenin one the greatest of profound thinkers, a dialectic materialist, who has made a contribution of inestimable value to the development

of a truly scientific world outlook.

All of these characteristics of Lenin, these facets of his activity - a leader of the proletarian revolution, a scientist-sociologist, a philosopher-materialist, - are actually but a single characteristic. They all are a consequence of V. I. Lenin's all-embrawing scientific--revolutionary outlook on the world.

It is precisely this outlook that permeates all of Lenin's activities and work, that we would like to examine once again, and to bring back to our memory on this 90-th anniversary of his birth all that is linked with his name.

Among the wide scope of problems we will examine one that is closest to us soviet natural scientists, the problem of Lenin's remarkable work in the field of the philosophy of natural sciences.

None of us soviet scientists of the second half of the 20-th century have any doubts regarding the worthlessness of of empiriocriticism and of the other idealistic and semi-idealistic philosophical trends. We are all firmly convinced in the actual existence of things in reality. We are no longer merely "unbridled" materialists. We have been educated on Lenin's ideas, that we have studied from schooldays. Being witness to the tremendous

revolutionary changes in science, we have become dialectic materialists, who have arrived at our point of view on life as a result of the philosofic education that we have received as well as as a result of our own observations each of us traveling his own particular scientific way. We have come to the dialectic-material outlook on life as one that is universally inevitable for all who live by science and who follow the evolution of modern science. That was not the situation a half a century ago. At that time a conversion was taking place, a complete radical change of physical, chemical ideas and concepts; the introduction of the mathematical framework, the language of mathematics now used by modern natural science. To us at present such revolutionary changes appear quite orderly and normal for developing science, but at that time many were those who took them as a negation of the objectivity of natural science theories.

Summing up the results of the revolution that had taken place in natural science at the close of the 19-th and the start of the 20-th centuries, V. I. Lenin devoted his capital work on philosophy "Materialism and Empiriocriticism" mainly to that part of the theory of knowledge known as gnosiology.

All our knowledge, the entire science complex in the last analysis leads to philosophical problems of the theory of knowledge. It is quite understandable that naturalists, who have become accustomed to a strict and thorough analysis of the empirical bases of science, have always tried to control the very process of knowledge. This was necessary in order to seggregate in human learining that which is true from all that had been brought into it by our imperfect methods of discovering the truth.

But it was precisely the empirical bases of the theory of knowledge that constituted the weak spot in the complex of natural sciences, in view of our incomplete knowldge of the facts, a weak spot by means of which those who sided with the religious point of view could, as it appeared to them, destroy the orderly structure of science. During relatively calm periods of scientific development, while existing scientific theories are beong perfected, the scientist-naturalist has become accustomed to talk of the different degrees of approximation of his own knowledge, without delving into problems of gnosiology.

For example, in creating the mathematical model of the heat transfer process in the early 18-th century, and assuming that the heat flow through a surface is proportional to the rate of temeperature drop in a direction

normal (perpendicular) to the surface, and verifying this hypothesis by experimentation, physicists knew that this was only a first approximation of the truth. In actuality the heat flow could be a function of several other factors: heat transfer by direct radiation, and so forth.

In the period of rapid development of science, however, when it was necessary to turn away from what appeared to be the basic concepts of physics, such as, for example, the impenetrability of matter, the absolute quality of time and distance, the possibility of a simultaneous definition of the position and velocity of microparticles, some scientists turned away from the usual and rational approach to the world that surrounds us.

Having fallen under the influence of professorial scholastics, of the official heler*) philosophy (as Lenin called it), these scientists started to seggregate and sometimes to develop a theory of knowldge in which only perceptions were stated to constitute reality. Refuting these viewpoints, Lenin, following on Marx and Engels, put forward that criterion of knowledge always used by natural scientists in all their own studies, - the criterion of actual practice. Applied to scientific theories, this cri-

*) Defined in Webster as that which covers up, or conceals. (Translator's note).

terion indicates the ability of theory to predict new phenomena, or at least to bring about a more exact knowledge of known phenomena. In its application to the theory of knowledge in the case of all those who do not suffer from hallucinations, this criterion points up the actual existence of an outside world with a degree of exactitude many times greater than that of any experimental or theoretical scientific investigations.

Characterizeing the significance of the criterion of actual practice, Lenin wrote:

"The viewpoint based on life, on actuality must be the primary and basic viewpoint of the theory of knowledge. It leads inescapably to materialism, refuting from the start the endless inventions of professorial scholastics. Naturally, we should not forget, - he added - that the criterion of actuality never will be capable of fully refuting or confirming in its substance any human concept. This criterion, in addition, is so "indefinite" that it will not permit human knowledge to become "absolute", and , at the same time, it is sufficiently definite to permit a merciless struggle against all manner of idealism and agnosticism". (V. I. Lenin, Works, vol.14, page 130).

If the criterion of actuality is denied, and if one is consistent in one's arguments and opinions, then

the only remaining philosophical systems are solipsism and agnoticism. Any other intermediate point of view, any attempts to bring order to, or to systematize our perceptions, by creating an outside world based on these perceptions, as was done by Mach, Avenarius and Russian empiriocritics, will in the last analysis inevitable lead to subjective idealism. Lenin proves this consistently and convincingly in his book. In "Materialism and empiriocriticism" Lenin stands before us as the most profound natural science philosopher, who consistently carries forward the dialectical-materialistic viewpoint in the theory of knowledge, and completely defeats the inconsistence and unscientific character of various shades of philosophic idealism.

In a bourgeois society there is a large category of official scientists who have set themselves the objective of upholding the validity of religious prejudices, of supporting the mystical foggy superstitions, wrapped up in an aureole of mystery, of proving the existence of God, a supremely intelligent being, according to whose will everything on earth happens.

These scientists asserted that only human perceptions and thought exist, and that no realistic m aterial world, subject to the laws of nature exists. The interplay of spiritual forces is determined by by the will of a supreme

being - God. A direct result of such a philosophy was that, since the world is organized by God, according to supreme wisdom, and reasonably, it is useless to try to change anything in it. It is useless, unnecessary and sinful, for example, to try to overthrow the power of the landowners and capitalists. The philosophers - apologists of the existing order - attempted to utilize new discoveries in physics to fortify their idealistic, fideistic viewpoint.

An important methodological problem of modern science, around which is waged a fierce battle between materialism and idealism, is that of the specifics of the laws governing large collective associations.

In virually all problems of physics, mechanics of continuous media, chemistry kinetics and so forth, the individual behaviour of particles of matter, of atoms, of chemical elements cannot in itself determine the course of the processes taking place in the system. Complex phenomena in gases, the pressure that they exert on bodies, the appearance in them of shock waves, the character of a laminar flow, the creation of eddies and so forth are due mainly to encounters bewteen gas particles, and are not even primarily a function of the results of these individual encounters, of the laws governing these separate encounters. In this case, outside forces, reacting on individual

particles such as weight, magnetic forces for charged particles and so on, in themselves likewise do not determine the behaviour of gases. The statistical result of the interaction of a large number of particles, as shown by modern mathematics, is always qualitatively new in comparison with the individual behaviour of these particles.

The evolutionary process of life on earth, as was shown by Ch. Darwin, is a function of the interaction of living beings, on the basis of natural selection. The appearance of the more perfect forms of life takes place as the very result of orderly procedures that control the development and changes of large associations of interacting species. In this example the result of inetractions is again found to be qualitativly new in comparison with the individual effect of such an interaction on each type.

The laws governing large collective associations play a primary role in an understanding of the life of society.

This example of an analysis of the problem of specifics of laws of large collectives shows us the identity between natural and social sciences. Stressing this identity, Lenin wrote: "The powerful trend from natural science to social knowledge existed, as is known, not only in the era of Petti but in the Marx era as well. This trend

has remained not less, if not more pwerful, in the 20-th century." (Works, vol.20, page 176).

Having discovered the laws of social development, Marx showed that these laws, governing the behaviour of large masses of people, to some small extent are determined by the indidual will of separate individuals. Of primary importance is their interaction in the production process.

Lenin talks about the fact that Marx views society as a naturalist, uncovering the objective laws of its development. The development of society, according to Marx, is a natural historical process.

A consistently materialistic viewpoint on history has brought Marx and his followers to the conclusion of the inevitable and early end of capitalism. This conclusion does not sit right with the ruling classes of bourgeois society. One of the orders given their philosophers in the realm of social sciences was to undermine these conclusions of marxism. Bourgeois philosophers attempted to carry out this order by a "refutation" of historical materialism, and at the same time to refute the materialistic viewpoint as a whole, so that, as we have seen, they could gain a twofold advantage. As a result, bourgeois philosophers constantly come out in opposition to historical mate-

rialism.

The problem of defending historical materialism against the attacks of bourgeois ideologies was completed by Lenin. Exposing idealism in all its forms, Lenin stressed that the struggle for a scientific viewpoint in the realm of social sciences blends with a struggle for the/scientific, materialistic viewpoint in the realm of natural sciences. Many times in his writings Lenin pokes fun cruelly at the "professorial apologetic science". He wrote repeatedly about the commercialism of bourgeois professirs. Together with I. Ditzgen, he calls them diploma holding lacqueya, who stultify the people with a much abused idealism.

Forcefully proving the reactionist nature of idealism, Lenin wrote in the concluding paragraph of "Materialism and empiriocriticism": "The latter (idealism - S.S.) is nothing but a more exact, a refined form if fideism, that stands fully armed, controls enormous organizations and continues unflinchingly to influence the masses, taking selfish advantage of the slightest fluctuation in philosophic thought. The objective class role of empiriocriticism is entirely reduced to slavish service to fideists in their struggle against materialism generally and historical materialism, in particular". (Works, vol.14, page 343).

* * *

The position of natural sciences at the start of the 20-th century was characterized by profound upheavals. A series of basic discoveries were made in those years, that completely upset the traditional system, of seemingly firmly established viewpoints in physics.

Following the discovery of X-rays, remarkable work was done in the area of radioactivity.

Atoms, previously thought to be indivisible, were found to be both divisible and interconvertible. The first outlines of the structural theory of the atom appeared.

The previously existing separate concepts of matter and electricity, naively thought to be the carriers - - one of the gravitational properties and of mechanical impenetrability, and the other of a charge, in the final analysis were found to be blended together. It was found that an electrical charge is one of the basic properties of matter.

Michelson's experiment that showed the independence of the speed of light from the motion of an inert system in which it is measured, led to the abolishment of the theory of universal ether, and to the theory of relativity that united space and time into a single physical reality.

At the same time remarkable ideas and discoveries in mathematics prepared the birth of a new science - - quantum physics. The work of Steklov, Fredholm, Schmidt and Gilbert created the basis of functional analysis and the spectral theory of operators. This is the study of the properties of the so-called natural values of operators. An example of natural values in classical physics is the natyral frequency of oscillations of various mechanical, electrical and similar systems.

Classical physics , in the study of the phenomenon of light, could successfully resolve such problems as the reflection and refraction of light. The wave theory of light, created by Maxwell as a mathematical conclusion of equations in partial derivatives, that describe a polarized vacuum, succeeded in giving a scientific explanation to such effects as diffraction and interference, that consist in the fact that in the propagation of light, waves of similar phases strengthen each other, and in different phases either weaken or destroy each other. The phenomenon of polarization of light was explained, as one in which the magnetic and electrical field of a lightwave oscillates only in a definite direction.

The laws of light emission and absorption, however, the mysterious structure of light psectra, emitted

or absorbed by different materials, remained beyond the realm of physical theory and completely ununderstandable. These phenomena of nature, as we now know, were intimately linked to the properties and structure of the "microworld", an explanation of which became available only during the first quarter of the 20-th century. The key to these new areas of physical phenomena was obtained in the application of methods and ideas of the spectral theory of operators, one of the branches of functional analysis that appreared in the beginning of the 20-th century.

Somewhat later, in the 20s and 30s, science discovered that systems of the microworld have different corresponding operators, while the natural values of operators of a specific type correspond to certain levels of energy of the systems. The passage of the system from one level to another is accomapnied by the emission or absorption of light of a specific frequency or of a quanta of specific dimensions. A new type of theoretical physics based on these mathematics soon explained the source of spectral lines and, having learned to compute them in advance, explained the effects on their frequencies and the spread of all types of outside reactions. New mathematical discoveries, that emerged together with the new physics led to

crossfertilization between these two sciences and to the creation of a new physics language, a new complex of concepts, that permitted the construction of model atomic phenomena, followed by a new physical aspect of the world.

Here the old model appears as a much rougher approximation of reality. The equations and laws of classical physics are seen simply as an expression of certain macroscopic phenomena, and far from all of them at that.

Such are the consequences of the revolution in natural sciences that Lenin wrote about. In "Materialism and empiriocriticism", a most profound understanding is seen in every line of the coming/~~swing~~ broad and flourish of scientific thought.

Acknowledgment of the changing nature of the concepts of natural science, of their approximate nature at every stage, the clear understanding of the profoundly revolutionary nature of true sceince, that delves deeper and ever deeper into absolute truth, - are the distinctive aspects of a leninist world outlook. Lenin unswervingly stood on the foundation of progressive ideas in natural sciences, at a time when the scientific revolution was only beginning and when, according to a remark by S. I. Vavilov, all the greatest physicists of the world still remained wholly wedded to old "classical" positions.

The onslaught of mathematical ideas, methods and concepts in all branches of natural sciences, that is now so strong, was already significant at the start of the 20-th century. At that time, to scientists who were used to a mathematical descrition of phenomena, the differential equations of mathematical physics appeared as an accurate and adequate picturization of the world. Forgetful of the fact that this was merely an approximate method of description of reality, certain physicists forgot reality itself, and found themselves objectively on positions of idealism. In order to help them grasp the complicated stages of scientific progress, both these and many aothers that are difficult to understand, Lenin in his work "Materialism and empiriocriticism" analyses the laws of dialectic scientific development, which to this day retains its full force and its purity. These laws of dialectics were one and the same for natural science and for social science. Lenin - the most brillant philosopher, sociologist and economist - knew these laws and knew how to utilize them in his work. It is precisely for that reason that, not being a specialist in physics, chemistry and mathematics, Lenin succeeded in finding his way in all these sciences in their condition in his time.

Without ever expressing direct opinions on

extremely specialized scientific problems, without interfering in the struggle of opinions wherevr in substance they did not touch on fundamental philosophical problems, Lenin, nevertheless, always sensed the new, the leading trend.

Among the problems in the new physics was the very difficult one of space and time. Old materialistic philosophers talked about the fact that matter has a reality in space and in time, but the latter concepts were understood in a very abstract fashion. In the new physics, space and time have received a concrete physical determination. The unity of space and time discovered by Einstein, exists as a physical reality regardless of our perception. One had to be weel ahead of one's times to write in 1908 the following lines: "Human concepts of space and time are relative, but these relative concepts put together constitute an absolute truth. These relative concepts in their development follow the direction of absolute truth, approach it. The changing aspect of human conceptions of time and space refutes the objective reality of either as little as does the changing nature of scientific knowledge regarding the structure and the forms of motion of matter refute the objective reality of the outside world." (V. I. Lenin, Works, vol.14, pages 162-163).

Lenin's attitude toward new problems in natural sciences, mathematics and physics was determined by the dialectic nature of his thinking. It was founded on natural laws that he understood and new how to apply in practice. Unquestionably, Lenin foresaw the rapid development of natural sciences, that followed on the heels of the publication of "Materialism and empiriocriticism".

Let us note another important aspect of Lenin's views. Being a grwat thinker and a leading theoretician, he understood fully the need for the abstract, I would say, mathematical approach to the study of phenomena of nature and society. This is written about in remarkable fashion in "Philosophical notebooks":

"Thought rising from the concrete to the abstract, if it is <u>correct</u>, does not...depart from the truth, but approaches it...From actual observation to abstract thought, <u>and from it to actuality</u> - such is the dialectic road to an understanding of the <u>truth</u>, to an understanding of objective reality". (Works, vol.38, page 161).

Modern science is now going through precisely that moment when this trend toward the abstract takes on concrete aspects in the form of an increasing application of mathematics to various types of practical activity.

Lenin warned against a confusion bewteen

the language and methods of mathematics on the one hand, and problems of theoretical knowledge on the other. We read in his writings:

"Indeed, an important problem of theoretical understanding does not consist in the degree of accuracy that we may have achieved in our descritpion of the interdependence of cause and effect, and whethervthese descriptions can be expressed in a strict mathematical formula, but in whether the source of our understanding of these interdependencies is the objective orderliness of nature, or the properties of our intellect, its innate ability to comprehend certain axiomatic truths and so on. That is what unalterably separates materialists such as Feuerbach, Marx and Engels from the agnostics (Humists) such as Avenarius and Mach". (Works, vol.14, pages 146-147).

He characterizes as reactionary nonsense the intention of G. Cohen to inculcate a spitit of idealism in schoolchildren through the study of higher mathematics.

The views of progressive scientists regarding the role played by mathematics in natural sciences are at present free from such aberrations. Natural scientists are aware of the approximate nature of mathematical descriptions of natural phenomena. The present mathematical method basically is one of costruction and study of models of

these phenomena. A mathematical model correctly reflects certain basic characteristics of that of which it is an image, but it cannot give its complete picturization. The method of mathematical models is profoundly dialectical. As our knowledge advances, the models become ever more perfect. Old models are discarded and new ones are created. The history of science in the 19-th and 20-th centuries knows of many examples when failure to evaluate completely or to underestimate the role of mathematics objectively could and did in fact serve to retard the development of science.

We have no right to forget such historical facts as the discovery of electromagnetic waves, i.e. radio-waves, and the establishment of their identity with infra-red, light, ultraviolet, X-rays and γ rays.

Studying the laws of electromagnetism, experimentally established by Faraday, Maxwell succeeded in writing a system of equations in partial derivatives for electromagnetic phenomena, that served as a good mathematical model of the laws of these phenomena. In terms of the degree of approximation to which electromagnetism was then studied, Maxwell's equations contained everything of most importance. He then studied these equations by means of the well prepared complex of classical mathematical physics. Maxwell's equations led to the wave equation that had been known

since the 18-th century. A direct conclusion from this was that of the wave nature of propagation of an electromagnetic field. The velocity of propagation of the waves of this field was computed and found to be equal to the velocity of light.

In this way the discovery of electromagnetic waves was made by Maxwell and by Hertz, who verified his conclusions by test, as a result of mathematical studies of equations that link the electrical and magnetic properties of a medium and of vacuum. If a mathematical model expressive of the properties of a medium, had not been constructed, the discovery of radiowaves would have been utterly impossible.

These same equations of Maxwell were, somehwat later, adopted by certain physicists at home and abroad as the final truth. These scientists were active opponents of the new quantum physics, who wished to reduce the entire complicated and bottomless world of physical phenomena to the equations of Maxwell, forgatting that these equations are no more than a model, that reflects a limited portion of the relationships in the outside world. In this case, an exaggeration of the role played by a methematical model was objectively reactional, it retarded the development of science.

In his article "Dialectics of light phenomena", the late president of the AS USSR, S. I. Vavilov, characterizing the model method, wrote: "For a precise understanding of natural science...a new, abstract but extremely broad method of investigations has thus been found, that may be termed the mathematical hypothesis method or mathematical extrapolation. Here mathematics acquire heuristic aspects, and, together with a controlling as well as heuristic method of experimentation, forms a powerful investigative weapon". (Coll. works, vol.III, page 21).

The present is once again the period of great discoveries in science and engineering and great changes, resulting from developments in mathematics. If steam in the 18-th century, followed by electricity in the 19-th century basically served to free humanity from the necessity to use physical, muscular strength in production, while during the first half of the 20-th century new and virtually unlimited sources of energy were found, then our era has been marked by the discovery in principle of the possibility of freeing man from all monotonous forms of intellectual labor.

In the coming epoch humanity will be alloted only the highest type of creative work. A new technical upheaval started with mathematics, and consists in the trans-

fer of the labor of computers and calculators to automated work on special highspeed electronic computers.

The automation of mathematical computations existed on a small scale (desk arithmometers, slide rule, various model arrangements) for many years, starting with the 18-th and 19-th centuries, but its significant dvelopment dates from the time that the logic of mathematics, on the one hand, and the pulse aspect of radioengineering on the other, were brought to bear on the problem. The work done by a calculator was successfully broken down into elementary arithmetical and logical operations. Logical and mathematical algorithms were created for them, followed by the construction of a machine that completed such operations at tremendous speeds. The algorismic method, i.e. the method of dismemberment into the simplest operations, used to control mathematical operations, was then applied in the most varied control processes, and became virtually universal. It was found to be applicable to the automatic control of engines and in many other types of human activity, everywhere where control consists in the digesting of incoming information, the subsequent working up of a solution in accordance with certain established rules, and the transmission of a command to the output unit.

Here we are talking not only about mathema-

tical machines, of course. At about the same time, mathematical analysis began to play an increasing part in various concrete problems of economics. Appropriate problems - problems of the most rational method of stamping forms from raw materials, the most efficient use of transport facilities, etc, brought forward the theory of finding the maxima and minima of linear functions of a large number of independent variables, subject to linear inequalities, the so-called linear programming, that first appeared in the Soviet Union and was later rediscovered in the USA.

Together with the algorithm theory, there appeared the so-called theory of plays, the theory of operations - disciplines that permitted the mathematical treatment of ever newer types of human activity, up to and including control of various branches of the national economy.

Yet another of Lenin's dreams is coming true, that of new scientific methods of government, that he expressed in his article "Better less,but better", written about the reorganization project of Rabkrin: "We must at all costs, in order to modernize our government structure, set for ourselves the goal: first - to study, second - to study and thirdly - to study and then make certain that science does not remain for us a dead letter or a fashionable

phrase (and this, there is no use in hiding that sin, is especially prevalent with us), that science should really be in our blood and become an essential part of our way of life fully and actually". (Works, vol.33, page 447).

Of course, it would have been for Lenin to imagine that the State Plan of the Union of SSR in 1959 would create a modern computing center in which all of the problems having to do with the control of industry and the planning of its development would be solved, but we see how close to this were Lenin's thoughts. He was the first to set forth the basis for the planning of great works of electrification and industrialization of the national economy, for raising labor productivity. Lenin rightly felt that a rise in labor productivity was the necessary prerequisite to a successful building of communism. Lenin's many-faceted activity is remarkable for its unity bewteen theory and practice, for the depth of its scientific analysis and its profoundly revolutionary nature, that permeates his world outlook.

As no one else, Lenin understood the role of science for modern society, and the part it would play in the building of communism. This part, as Lenin showed, is manysided. On the one hand the science of society is necessary to a socialistic state in order to correctly solve the tre-

mendous complex of political, economic, social and other problems, that inevitably confront those who are building communism. On the other hand, the building of communism presupposes the existence in the society of a labor productivity many times greater than that achieved by capitalism. Labor productivity must be rasied to a new level as a result of technical retooling of industry and agriculture.

"We know that a communist society cannot be erected if industry and agriculture are not revived, and this must not be done in the old way, - writes Lenin in the article "Problems of youth unions", - They must be revived on a modern basis, in accordance with the latest word of science". (Works, vol.31, page264). Lenin's following definition is classic: "Communism is Soviet power plus electrification of the entire country".

Engineering and science in the 20-th century are indissolubly linked together.

"Soviet power plus electrification of the entire country" to us means: "Soviet power plus science and modern engineering, built on that science".

Science in a socialist state is confronted by yet one more new prbblem. Humanity is entering the age of familiarity with space. Rockets that have been sent to the moon, that have photographed its hidden side, will

in the near future, be investigating our neighboring planets of the solar system. The thirst for knowledge, the desire to conquer the universe around us are becoming a necessity for all men of the epoch of communism. "Man is created for happiness, as a bird is created to fly". But happiness for man no longer consists in owning a good suit od clothes, good shirts, good food, a good swimming pool and so on. Even ownership of the entire treasury of world art: literature, music, painting, the theater is no longer sufficient for happiness. To be happy now man needs to fly, and to fly not just simply like a bird - we are already flying faster and higher than birds. Man is demanding to fly over the entire solar system, and after that, beyond its limits. He wishes to bend all universe before his feet, to examine the globe that is the earth , to solve the still unsolved problems of the microworld, to penetrate the deep mysteries of life and many other things. Science, therefore, will be one of the main forces of of man in a communist society. And many is the time when people, having flown from their native earth into the reaches of outer space, will remember the great Lenin, who sired the soviet state, soviet science and communism.

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